# A Test Lab Techno Corp.

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## MPE Report

| | | |
|---|---|---|
| Test Report No. | ： | 1510FS20 |
| Applicant | ： | AzureWave Technologies, Inc. |
| Manufacturer | ： | AzureWave Technologies, Inc. |
| Product Type | ： | IEEE 802.11 a/b/g/n Wireless LAN and Bluetooth Combo LGA Module |
| Trade Name | ： | AzureWave |
| Model Number | ： | AW-AM691NF |
| Date of Received | ： | Oct. 12, 2015 |
| Test Period | ： | Oct. 28, 2015 |
| Date of Issued | ： | Nov. 12, 2015 |
| Test Specification | ： | 47 CFR § 2.1091 |
| | | 47 CFR §1.1310 |
| | | ANSI / IEEE Std.C95.1-1992 |
| Location of Test Lab. | ： | Chang-an Lab. |

1. The test operations have to be performed with cautious behavior, the test results are as attached.
2. The test results are under chamber environment of A Test Lab Techno Corp. A Test Lab Techno Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples.
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Approved By ： Bill Hu (Bill Hu)　　Tested By ： Sky Chou (Sky Chou)

# Contents

# 1. Description of Equipment under Test (EUT)

| | | | | | |
|---|---|---|---|---|---|
| Applicant | AzureWave Technologies, Inc. | | | | |
| Applicant Address | 8F, No. 94, Baozhong Rd., Xindian,231 Taiwan | | | | |
| Manufacturer | AzureWave Technologies, Inc. | | | | |
| Manufacturer Address | 8F, No. 94, Baozhong Rd., Xindian,231 Taiwan | | | | |
| Product Type | IEEE 802.11 a/b/g/n Wireless LAN and Bluetooth Combo LGA Module | | | | |
| Trade Name | AzureWave | | | | |
| Model Number | AW-AM691NF | | | | |
| FCC ID | TLZ-AM691NF | | | | |
| Class II Permissive Change | Add Platform. | | | | |
| Frequency Range | IEEE 802.11b / 802.11g / 802.11n 2.4GHz 20MHz: 2412 ~ 2462 MHz<br>IEEE 802.11n 2.4GHz 40MHz: 2422 ~ 2452 MHz<br>IEEE 802.11a Band I : 5180 ~ 5240 MHz<br>IEEE 802.11n 5GHz 20MHz Band I : 5180 ~ 5240 MHz<br>IEEE 802.11n 5GHz 40MHz Band I : 5190 ~ 5230 MHz<br>Bluetooth BR/EDR : 2402 ~ 2480 MHz<br>Bluetooth LE : 2402 ~ 2480 MHz | | | | |
| Transmit Power (conducted power) | IEEE 802.11b: | 0.071 | W / | 18.49 | dBm |
| | IEEE 802.11g: | 0.101 | W / | 20.03 | dBm |
| | IEEE 802.11n 2.4GHz 20MHz: | 0.103 | W / | 20.14 | dBm |
| | IEEE 802.11n 2.4GHz 40MHz: | 0.029 | W / | 14.56 | dBm |
| | IEEE 802.11a Band I: | 0.041 | W / | 16.11 | dBm |
| | IEEE 802.11n 5GHz 20MHz Band I: | 0.043 | W / | 16.32 | dBm |
| | IEEE 802.11n 5GHz 40MHz Band I: | 0.041 | W / | 16.14 | dBm |
| | Bluetooth BR/EDR | 0.007 | W / | 8.75 | dBm |
| | Bluetooth LE | 0.006 | W / | 8.04 | dBm |
| Antenna Specification | WLAN 2.4GHz : 2.77 dBi<br>WLAN 5GHz : 2.64 dBi<br>Bluetooth: 2.77 dBi | | | | |
| Antenna Designation | PIFA PCB Antenna | | | | |
| Host Information | Product Type: Personal Computer<br>Trade Name: ECS ELITEGROUP<br>Model Name: EF20RA | | | | |
| RF Evaluation | 0.42 W/m$^2$ | | | | |

The above equipment was tested by A Test Lab Techno Corp. For compliance with the requirements set forth in 47 CFR § 2.1091 & 47 CFR § 1.1310. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties

## 2. Human Exposure Assessment

Due to the design and installation of this product, it is not possible to conduct SAR evaluation. This is because client either manufactures or supplies the antenna(s) that will be used in the installation of this product. Therefore, this product will be evaluated as a mobile device per 47 CFR §1.1310 titled “Radiofrequency radiation exposure limits”, generally referred to as MPE limits.

In 47 CFR § 2.1091, paragraph (b) defines a mobile device as “a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 cm is normally maintained between the transmitter’s radiating structure(s) and the body of the user or nearby persons. ” This product is intended to be installed into a vehicle such that the unit is physically secured at one location. In the installation guide supplied with the product,

Client has made the following statement: “IMPORTANT: To meet the FCC’s RF Exposure Guidelines, the antenna should be installed so there is at least 20 cm of separation between the body of the user and nearby persons and the antenna”. Based on the installation of the transceiver and the antenna, the transmitters radiating structure is more than 20 cm from the user. Thus, this product is a “mobile device” as defined in section § 2.1091 paragraph (b).

| Exposure evaluation |
| --- |
| $$S = \frac{PG}{4\pi R^2}$$<br>Where<br>S: power density<br>P: power input to the antenna<br>G: power gain of the antenna in the direction of interest relative to an isotropic radiator.<br>R: distance to the center of radiation of the antenna. |

## 3. RF Output Power

| Band | CH | Frequency (MHz) | Average Conducted power (dBm) | | |
|---|---|---|---|---|---|
| | | | ANT-0 | ANT-1 | ANT-0+1 |
| IEEE 802.11b | 1 | 2412.0 | 18.49 | --- | --- |
| | 6 | 2437.0 | 15.51 | --- | --- |
| | 11 | 2462.0 | 16.46 | --- | --- |
| IEEE 802.11g | 1 | 2412.0 | 12.85 | --- | --- |
| | 6 | 2437.0 | 20.03 | --- | --- |
| | 11 | 2462.0 | 12.17 | --- | --- |
| IEEE 802.11n 2.4GHz 20MHz | 1 | 2412.0 | 11.68 | 11.97 | 14.84 |
| | 6 | 2437.0 | 16.91 | 17.33 | 20.14 |
| | 11 | 2462.0 | 10.52 | 10.78 | 13.66 |
| IEEE 802.11n 2.4GHz 40MHz | 3 | 2422.0 | 8.22 | 8.81 | 11.54 |
| | 6 | 2437.0 | 11.33 | 11.76 | 14.56 |
| | 9 | 2452.0 | 9.23 | 9.71 | 12.49 |
| IEEE 802.11a | 36 | 5180.0 | 15.94 | --- | --- |
| | 40 | 5200.0 | 16.07 | --- | --- |
| | 44 | 5220.0 | 16.09 | --- | --- |
| | 48 | 5240.0 | 16.11 | --- | --- |
| IEEE802.11n 5GHz 20MHz | 36 | 5180.0 | 13.01 | 13.51 | 16.28 |
| | 40 | 5200.0 | 13.09 | 13.41 | 16.26 |
| | 44 | 5220.0 | 13.10 | 13.46 | 16.29 |
| | 48 | 5240.0 | 13.12 | 13.49 | 16.32 |
| IEEE802.11n 5GHz 40MHz | 38 | 5190.0 | 12.10 | 12.47 | 15.30 |
| | 46 | 5230.0 | 12.97 | 13.29 | 16.14 |

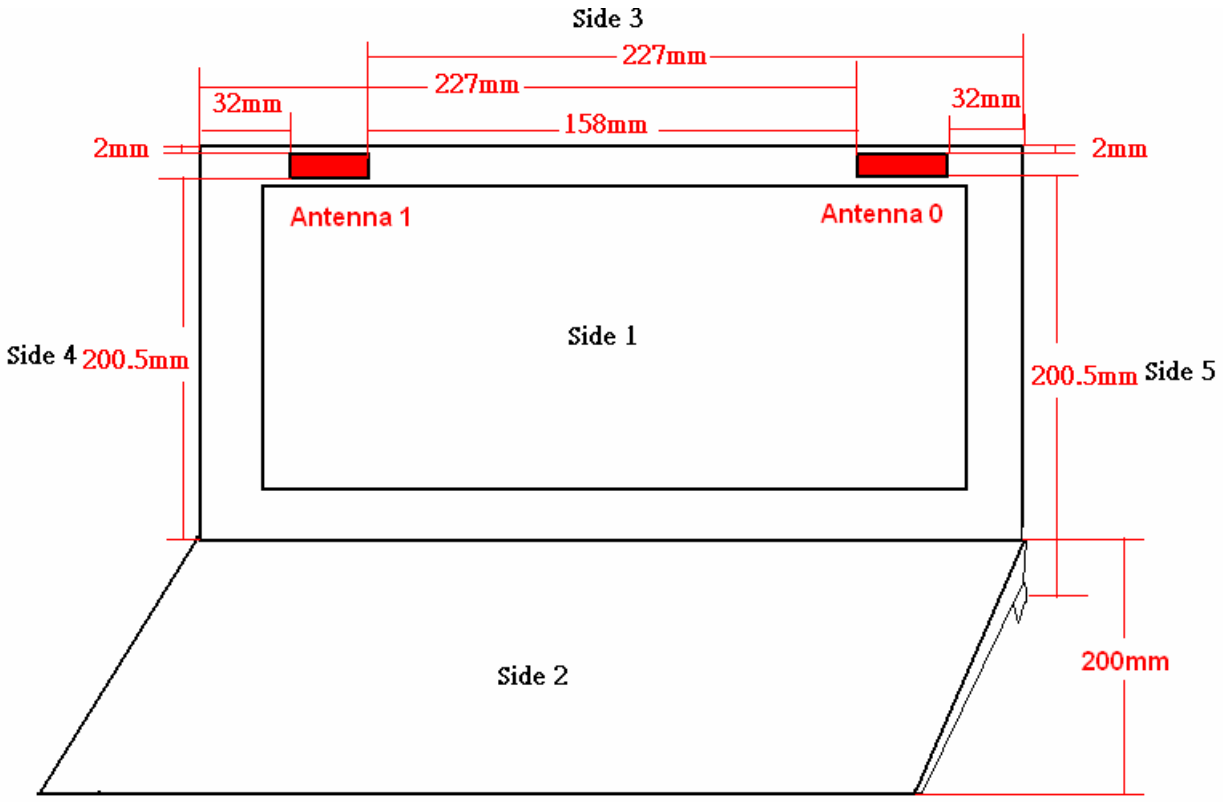
Note : The average power measure by lowest data rate.

| Band | CH | Frequency (MHz) | Average Power (dBm) |
|---|---|---|---|
| Bluetooth BR/EDR | 0 | 2402 | 8.17 |
| | 39 | 2441 | 8.70 |
| | 78 | 2480 | 8.75 |
| Bluetooth LE | 0 | 2402 | 7.35 |
| | 19 | 2440 | 7.78 |
| | 39 | 2480 | 8.04 |

Note : The Bluetooth BR/EDR power measurement by 1M DH1.

## 4. Antenna location

| Antenna-User | | | |
|---|---|---|---|
| Distance of WLAN/Bluetooth Antenna 0 to edge | | Distance of WLAN Antenna 1 to edge | |
| WLAN/Bluetooth Antenna 0 to Side 1 | 5mm | WLAN Antenna 1 to Side 1 | 5mm |
| WLAN/Bluetooth Antenna 0 to Side 2 | 200.5mm | WLAN Antenna 1 to Side 2 | 200.5mm |
| WLAN/Bluetooth Antenna 0 to Side 3 | 2mm | WLAN Antenna 1 to Side 3 | 2mm |
| WLAN/Bluetooth Antenna 0 to Side 4 | 227mm | WLAN Antenna 1 to Side 4 | 32mm |
| WLAN/Bluetooth Antenna 0 to Side 5 | 32mm | WLAN Antenna 1 to Side 5 | 227mm |
| WLAN/Bluetooth Antenna 0 to Side 1 | 5mm | WLAN Antenna 1 to Side 1 | 5mm |



## 5. Test Result

| Antenna 0 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Band | Frequency (MHz) | Limit (mw) | Distance [R] (cm) | Max tune-up Power (upper limit) [P] (dBm) | ANT Gain (dBi) | Numeric Gain [G] (dBi) | Duty Cycle | [P] x [G] with Duty cycle [TP] (mW) | Power Density [S] (mw)/cm^2 |
| IEEE 802.11b | 2412.0 | 1 | 20 | 19 | 2.77 | 1.89 | 1 | 150.13 | 0.030 |
| | 2437.0 | 1 | 20 | 16 | 2.77 | 1.89 | 1 | 75.24 | 0.015 |
| | 2462.0 | 1 | 20 | 17 | 2.77 | 1.89 | 1 | 94.72 | 0.019 |
| IEEE 802.11g | 2412.0 | 1 | 20 | 13.5 | 2.77 | 1.89 | 1 | 42.31 | 0.008 |
| | 2437.0 | 1 | 20 | 20.5 | 2.77 | 1.89 | 1 | 212.06 | 0.042 |
| | 2462.0 | 1 | 20 | 12.5 | 2.77 | 1.89 | 1 | 33.61 | 0.007 |
| IEEE 802.11a | 5180.0 | 1 | 20 | 16.5 | 2.64 | 1.84 | 1 | 82.19 | 0.016 |
| | 5200.0 | 1 | 20 | 16.5 | 2.64 | 1.84 | 1 | 82.19 | 0.016 |
| | 5220.0 | 1 | 20 | 16.5 | 2.64 | 1.84 | 1 | 82.19 | 0.016 |
| | 5240.0 | 1 | 20 | 16.5 | 2.64 | 1.84 | 1 | 82.19 | 0.016 |
| Bluetooth BR/EDR | 2402.0 | 1 | 20 | 9 | 2.77 | 1.38 | 1 | 10.96 | 0.002 |
| | 2441.0 | 1 | 20 | 9 | 2.77 | 1.38 | 1 | 10.96 | 0.002 |
| | 2480.0 | 1 | 20 | 9 | 2.77 | 1.38 | 1 | 10.96 | 0.002 |
| Bluetooth LE | 2402.0 | 1 | 20 | 8.5 | 2.77 | 1.38 | 1 | 9.77 | 0.002 |
| | 2440.0 | 1 | 20 | 8.5 | 2.77 | 1.38 | 1 | 9.77 | 0.002 |
| | 2480.0 | 1 | 20 | 8.5 | 2.77 | 1.38 | 1 | 9.77 | 0.002 |

Note : 1.The Numeric Gain calculated by 10^(ant. Gain(dBi) /10).

2..The power measure by lowest data rate.

3. WLAN and Bluetooth share the same antenna 0, and cannot transmit simultaneously.

| Antenna 0+1 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Band | Frequency (MHz) | Limit (mw) | Distance [R] (cm) | Max tune-up Power (upper limit) [P] (dBm) | ANT Gain (dBi) | Numeric Gain [G] (dBi) | Duty Cycle | [P] x [G] with Duty cycle [TP] (mW) | Power Density [S] (mw)/cm^2 |
| IEEE 802.11n 2.4GHz 20MHz | 2412.0 | 1 | 20 | 15.25 | 2.77 | 1.89 | 1 | 63.31 | 0.013 |
| | 2437.0 | 1 | 20 | 20.5 | 2.77 | 1.89 | 1 | 212.06 | 0.042 |
| | 2462.0 | 1 | 20 | 14.25 | 2.77 | 1.89 | 1 | 50.29 | 0.010 |
| IEEE 802.11n 2.4GHz 40MHz | 2422.0 | 1 | 20 | 11.75 | 2.77 | 1.89 | 1 | 28.28 | 0.006 |
| | 2437.0 | 1 | 20 | 14.75 | 2.77 | 1.89 | 1 | 56.42 | 0.011 |
| | 2452.0 | 1 | 20 | 12.75 | 2.77 | 1.89 | 1 | 35.60 | 0.007 |
| IEEE802.11n 5GHz 20MHz | 5180.0 | 1 | 20 | 16.75 | 2.64 | 1.84 | 1 | 87.06 | 0.017 |
| | 5200.0 | 1 | 20 | 16.75 | 2.64 | 1.84 | 1 | 87.06 | 0.017 |
| | 5220.0 | 1 | 20 | 16.75 | 2.64 | 1.84 | 1 | 87.06 | 0.017 |
| | 5240.0 | 1 | 20 | 16.75 | 2.64 | 1.84 | 1 | 87.06 | 0.017 |
| IEEE802.11n 5GHz 40MHz | 5190.0 | 1 | 20 | 16.75 | 2.64 | 1.84 | 1 | 87.06 | 0.017 |
| | 5230.0 | 1 | 20 | 16.75 | 2.64 | 1.84 | 1 | 87.06 | 0.017 |

Note : 1.The Numeric Gain calculated by 10^(ant. Gain(dBi) /10).

2..The power measure by lowest data rate.

3. WLAN and Bluetooth share the same antenna 0, and cannot transmit simultaneously.